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IMPORTANCE OF INTELLIGENT ROOMS FOR ENERGY SAVINGS IN THE HOTEL INDUSTRY

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Abstract: Thanks to the application of new technologies which enable rational use of energy, hotel company can now reduce power consumption per night compared to the average expenses of hotels of same quality. This has been enabled by the implementation of so- called *intelligent hotel-room system*, which includes control system and optimal consumption of energy and water, along with regulation and optimal use of heating and cooling system. The underlying assumption of this report states that the efficacy of energy is not the result of the investment in sophisticated technology only, but is also modified by monitoring and active management of energy consumption. Therefore, it requires specialist knowledge and maintenance workers training. Thus, company's ecological orientation demands an additional advance in the domain of human resources administration. From the economic standpoint, the report deals with the research in economic effects of intelligent hotel room based on the research in concrete examples in hospitality industry. Furthermore, the paper analyses growing demands and problems in energy supply system of large tourist facilities which have to provide an ultimate solution to energy consumption. In conclusion, there is a need of hotel companies to conduct their business in accordance with ecological demands.

Keywords: intelligent hotel room, new technologies, energy.

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INTRODUCTION

The concept of intelligent hotel room is related to an intelligent business system called Business Intelligence (BI). The term does not imply databases or lengthy reports, moreover it is a system which assists the decision-making process of a company.

The Hotel industry acquires a vast amount of data from various systems: starting from information technology to excel file in which data is entered on weekly, monthly or quarterly basis by analysts, officers, controllers and the rest of personnel. Nevertheless, the data can generate knowledge only after it has been processed and presented in an appropriate manner. Otherwise, it is just another fragment stored on the database worthless to the company. Business intelligence systems enable transformation of that data into a piece of information and is clearly and simply presented to the end user, which allows making the right business decisions based on accurate, precise and detailed information.

Execution and advisory experts in business intelligence sectors point out endless possibilities, while the management has to choose information relevant at a particular moment. Accurate and well-timed information facilitates bringing the most favourable decisions, thus possibly reducing expenses. Implementation of knowledge and appliances helps an intelligent room to accomplish its goals by:

- saving in electric power and water consumption
- co-ordinating and unobstructing operation of all appliances in room v
- maximizing comfort and safety of guests
- enhancing safety and quality level
- increasing efficiency of hotel staff thanks to continuous flow of new information
- raising environmental awareness among guests and hotel staff

As everything stated above shows, the objective of this paper is to demonstrate that thanks to knowledge and new technologies it is possible to use energy in a more rational way within a hotel establishment starting from a hotel room as the smallest unit, as well as to run business in an environmentally responsible manner. The subject matter of the research project is the analysis of electric energy consumption per month at Sol Garden Istra Hotel in Umag. Thanks to application of new technologies there was a 32,44 % decrease in energy consumption per night when compared with the average consumption in hotels of same quality. Analysis of several large hotel chains and their strategies on energy savings have also been presented in the paper. The central task of the paper is to prove the thesis that only with high-quality planning and construction solutions, along with sophisticated technology for consumption monitoring, required specialist knowledge and personnel training, maximum energy efficiency can be achieved.

The paper consists of an introduction and four chapters. The first chapter presents functions and the way in which an intelligent room operates. A comparison between a hotel with an intelligent-room system and those of the same quality and size but without the system, as well as an analysis of energy consumption at hotel chains

worldwide, is made in the second chapter. The third part brings energy conservation tips, and the fourth chapter accounts for specialist knowledge and human resources training. The conclusion urges that operational efficiency has to be increased by limiting energy consumption, continuous equipment maintenance and investment in human resources.

1. INTELLIGENT ROOM CONCEPT

The term intelligent or "smart" hotel room denotes a microprocessor-operated unit which controls all parameters important for hotel room operation. That includes the control of temperature, entrance/exit, alarm system, etc. In order to increase efficiency, the units are connected to a computer, thus bringing the entire system under one central control[2]. At present, computers have the major role in all hotel industries because, except record keeping, they are used for operation, and they control the entire system as well. It has been proven that investments into new technologies are lucrative in a short time, not only financially, but also in terms of increased efficiency and safety.

European Installation Bus (EIB) is the leading system of intelligent wiring worldwide which will in the forthcoming future fully replace traditional wiring and give us the possibility to adjust our living space (hotel room) to ourselves. There are no technical limitations regarding the size of the system or slow information flow. Limitations are primarily the result of architects' creativity and users' desires. The users of an intelligent room are not only guests, but hotel staff at all levels as well. It is guests who stay in rooms, so their "requirements, expectations and desires should be anticipated, prescribed and satisfied, since customers define quality".[3]

One of the central problems that hoteliers confront is the high demand of electricity used by tourists and tourist facilities at peak times of the day: this can sometimes result in electric surges and power failures. This kind of peak load, in quite a few cases, costs as much as the daily electrical energy consumption. The total power used in a hotel is not fixed; moreover it reaches its maximum at particular times. This is usually after lunch time when the majority of people use air conditioners, hot water, etc. Since these sorts of electric surges that the power grid receives are predictable, the EIB system can accumulate energy (hot water, lowering temperature in rooms) in order to control extra consumption during this period.

On the other hand, peak loads that do not occur in regular intervals are unpredictable, thus a measuring instrument that sends information about current use to the EIB system every 2-3 seconds, is used. Based on the information received, the

[2] For more see http://www.adria-electronic.hr/hoteli.htm (25.11.2007)
[3] Avelini-Holjevac, I., "*Estetika i dizajn kao dimenzija kvalitete proizvoda i usluga primjer: Hrvatski turisticki proizvod*", 8. Hrvatska konferencija o kvaliteti pod motom "Kvaliteta kao drustvena stvarnost", Conference Proceedings (CD), Hrvatsko drustvo za kvalitetu, Brijuni, 14.-16.svibnja 2007

system will discard and reinstate loads on to power grid. "Additional" loads will be defined in accordance with hotel technology.[4]

An intelligent hotel room includes several operational systems, and according to occupancy status at a moment, it chooses the appropriate operational system itself (table 1).

Apart from the presented operational activities, it is possible to set other functions as well, guest's reception at the room for example. On entering a room and inserting a keycard, the energy usage could rise from 0% to 100% as certain facilities such as lighting, air conditioning and shutters are activated.

Intelligent room function can be performing in several ways, nevertheless, the mode that has the most cost-effective price-requirements ratio will be chosen.

Right of access to restricted areas in a hotel is controlled by keycard to which a function required is given in a given moment. There is a difference between hotel staff's key and guests' key. Keycards assigned to hotel staff give access to hotel areas according to job description, and are issued in employee's name, with or without expiry date.

Table 1: Example of room occupancy status and operational system

PRESENT SITUATION	**OPERATIONAL SYSTEM**
Room is not allotted	All electrical appliances are off, except cooler (mini bar)
Room is allotted, guest is not present in the room	Cooler in use; AC unit keeps temperature 3 °C lower than outside temperature; AC unit does not function if the window is open;
Room is allotted guest is present in the room	All room appliances and functions can be used; room temperature-according to guest's request (e.g. 22-28 °C) AC unit does not function if the window is open;
Room is not allotted Presence in the room detected	Reception informed of an unauthorised entrance (hotel visualisation)

Source: Elektromagazin Hrvatska, see www.elmah.hr (25.11.2007)

[4] http://www.gradst.hr/library/journals/catalogue_G/GO 21/Casopis za graditeljstvo, instalacije, opremu i energiju 21. Stoljeca, prosinac, 2004. (25.11.2007.)

Upon arrival, hotel guests receive their keycard at the reception desk which provides free access to unrestricted areas and lasts till the end of their stay. After the expiry date, the key is invalid and accesses to hotel facilities are prevented. In the same way, if the key is reported lost, it is declared invalid, and the guest is granted a new key. That enables guests and hotel staff entrance to various hotel areas without carrying a bundle of keys, and unauthorised entrance is prevented. Furthermore, it is important to note that it also allows surveillance of every key used at any time or at any place. Authorisations and restrictions acquired by keycards correspond to the requirements and hotel industry business policy. The use of various electronic keys instead of cylinder-lock keys for entering hotel rooms and other facilities has became a standard.

The question that arises is why keycards are better than door keys. There are several logical answers to the question raised:

a) the frequent problem of losing and duplicating keys, which led to replacement of cylinders, has been solved, since keycard code is annulled by a new key
b) electronic key is granted for a required time span
c) keycards to specified hotel facilities is given to hotel staff (multiple entry keycards - a bundle of keys is not required any more)
d) data registered on the lock allows to do subsequent entrance analysis which enhances guests' safety, reduces the possibility of theft and unauthorised entrance
e) several keycards can be made for one guest room (if there are several guests sharing a room, but do not stay together all the time)
f) a single keycard can open hotel garage ramp, sports-facilities and wellness doors, and it is also possible to put hotel services on room-account charge thanks to connection with central unit of hotel operation system
g) keycards can be prepared and sent to guests/travel agency/ tour operator in advance to avoid commotion and waiting at the reception desk upon arrival of large guest groups

1.1. Intelligent room functions

Electrical energy conservation function- energy can be saved by adjusting air conditioning, heating and lighting systems to guest's presence in a room. Temperature levels in a room are regulated as shown in table 1: room not allotted (antifrost mode), room is allotted, but the guest is not in the room (reduced operational mode), guest present in the room (comfort requirements mode). Up to a particular moment prior to guest's arrival the room operates on "very economical" temperature. At a specific moment prior to guest's arrival at the hotel, the control system sends a signal to room system to switch over to "economical" temperature, which is set when a room is allotted, but the guest is not present in the room.

When a guest leaves the room, room temperature switches back to predetermined "economical" mode, the lighting and water are off, and other energy-consuming functions are being readjusted. Air conditioner deactivates immediately if the window is open. When a guest leaves the room, the lighting turns off automatically.

Moreover, if a guest is not staying at the hotel anymore, and there are no reservations to the room, there is no energy consumption in the room.

Where room heating is concerned, the importance of high-quality insulation has to be emphasised, since it reduces costs and increases savings.

Access and room presence- thanks to Read or Read & Write technology, it is possible to enter and store data regarding time, place and person entering guest rooms, moreover the same keycard is used to check the presence function in a room. The system sustains several entrance categories such as: guest, room attendant, waiter, maintenance personnel, and management.

- *room entrance with keycard*
- *guest room entrance door surveillance- security alarm*
- signal of guest's presence in the room

Alarm system- The system manages SOS-alarm units in bathrooms, guest rooms and shared facilities. The system also sustains water, smoke and fire sensors. An alarm button would send an emergency call and indicate it on a screen at the reception desk.

Air conditioning- includes intelligent room temperature control and air purification devices in room and shared facilities. It is also possible to predetermine points for devices such as heat-pumps, circulation-pumps, etc.

Lighting control- lighting can be set in one of the three following modes, and thus controlled:

1. lighting is on when a guest is in the room
2. lighting is continually on
3. lighting continually off

When lighting is set in the first mode, once a guest leaves the room only cooler remains on. Energy saving function is also present, since economical diodes last long and consume negligibly low amounts of energy.

Servicing- the service sustains whole range of maintenance functions, which enhance communication among hotel staff such as information whether a room has been tidied, call for room attendants, "Do not disturb" [5]note.

Guests can adjust temperature, AC unit to their needs, activate "do not disturb" signal, call for a room attendant or send SOS call. All the messages and functions are registered and indicated on a display unit places beside the room entrance and at the reception desk. One can start the functions listed by selecting a combination of operational modes which primarily satisfies guests' desires, followed by the requirements of the hotel and hotel staff.

[5] see http://www.optima-inz.com/isobe.htm (28.11.2007)

2. AN EXAMPLE OF ENERGY EFFICIENCY IN HOTEL INDUSTRY

2.2. Hotel complex "SOL GARDEN ISTRA" UMAG

In order to control energy consumption and reach maximum work efficiency, the hotel complex has implemented an "intelligent room" system, a complex system which integrates energy and water consumption control and efficiency, as well as heating-cooling regulation and efficiency. All the systems record events in chronological order, while consumption rate is presented in graphs with alarms set (sent via text messages). Statistics and reports for qualified maintenance workers and indexes analysis for management on hotel and management boar level are also registered in the systems.

The table below presents daily load during August 2006. Sol Garden Istra hotel A, a newly built hotel with introduced a new system of maximum energy efficiency, is compared to Sol Garden Istra hotel B, a standard hotel of same category.

The actual energy consumption was estimated by dividing daily load by figure 27 (the number of days in month less four days for which there is no data available) to acquire the exact amount of kW spent per night. Hotel A spends between 0,23 and 0,29 kW per night, while hotel B spends from 0,61 to 0,76 kW per night, with higher or lower during the day. Even more important for a successful business is the amount of electric energy used during the day, which varies from 32,91% up to incredible 42,30% on 27.08.2006. Based on the data presented in the table 2, hotel A achieved 32,44% of energy efficiency per month. The analysis of electrical energy expenses shows the efficiency level of newly built hotel A and positive effect of the sophisticated technologies (thus justifying investment made) in energy efficiency.

The results of electrical energy efficiency presented by Sol Garden Istra have been achieved primarily thanks to central electrical energy use control system and peak load limitation, intelligent room system, thermal insulation of the hotel, careful selection and elaboration of lighting management, cautious equipment selection, as well as to hotel staff training and company's environmental awareness.

Table 2. The analysis of daily energy consumption based on comparison between Sol Garden Istra Umag hotel A (the new technologies implemented) and Sol Garden Istra Umag hotel B (standard hotel of the same category)

Date	kW/ night Hotel A	kW/ night Hotel B	days in month	actual consumption Hotel A	actual consumption Hotel B	% savings per day
01.08.2006.	7,90	20,43	27	0,29	0,76	38,67%
02.08.2006.	7,40	19,54	27	0,27	0,72	37,87%
03.08.2006.	7,40	20,01	27	0,27	0,74	36,98%
04.08.2006.	0,00*	17,58	27	0,00	0,65	0,00%

(continued)

Date	kW/ night Hotel A	kW/ night Hotel B	days in month	actual consumption Hotel A	actual consumption Hotel B	% savings per day
05.08.2006.	0,00*	17,27	27	0,00	0,64	0,00%
06.08.2006.	7,10	18,55	27	0,26	0,69	38,27%
07.08.2006.	6,70	17,70	27	0,25	0,66	37,85%
08.08.2006.	7,30	18,83	27	0,27	0,70	38,77%
09.08.2006.	6,50	16,88	27	0,24	0,63	38,51%
10.08.2006.	6,70	17,15	27	0,25	0,64	39,07%
11.08.2006.	6,30	17,80	27	0,23	0,66	35,39%
12.08.2006.	6,40	16,94	27	0,24	0,63	37,78%
13.08.2006.	6,20	16,62	27	0,23	0,62	37,30%
14.08.2006.	6,30	17,47	27	0,23	0,65	36,06%
15.08.2006.	6,50	18,67	27	0,24	0,69	34,82%
16.08.2006.	6,70	20,36	27	0,25	0,75	32,91%
17.08.2006.	7,20	20,23	27	0,27	0,75	35,59%
18.08.2006.	7,80	20,18	27	0,29	0,75	38,65%
19.08.2006.	7,10	18,44	27	0,26	0,68	38,50%
20.08.2006.	7,10	19,04	27	0,26	0,71	37,29%
21.08.2006.	6,50	17,88	27	0,24	0,66	36,35%
22.08.2006.	6,50	17,48	27	0,24	0,65	37,19%
23.08.2006.	6,50	17,75	27	0,24	0,66	36,62%
24.08.2006.	6,50	17,95	27	0,24	0,66	36,21%
25.08.2006.	0,00*	16,97	27	0,00	0,63	0,00%
26.08.2006.	0,00*	18,66	27	0,00	0,69	0,00%
27.08.2006.	7,00	16,55	27	0,26	0,61	42,30%
28.08.2006.	6,30	18,02	27	0,23	0,67	34,96%
29.08.2006.	6,40	17,86	27	0,24	0,66	35,83%
30.08.2006.	6,50	18,18	27	0,24	0,67	35,75%
31.08.2006.	6,50	17,98	27	0,24	0,67	36,15%
Total:	**183,3**	**564,97**		**6,79**	**20,92**	**32,44%**

*Data unavailable

Source: according to the data in “Projekt energetske ucinkovitosti”- Hotel Sol Garden Istra Umag, October 2007

2.3. Holiday Inn

Thanks to an intelligent room system-a technology called "guest room energy management" (GREM) Holiday Inn hotel in Madison (SAD) saved 24 000$ on electricity expenses. The system was installed in 110 guest rooms. The study compared period between January and September 2006.

Table 3. Measurement and verification study findings (the survey)

PROJECTED ANNUAL ELECTRICITY SAVINGS	CALCULATED SAVINGS FOR A NINE MONTH PERIOD	% OF ANNUAL SAVINGS ATTAINED
378.673 kWh	381.908 kWh	100,01

Source: http://focusonenergy.com/data/common/dmsFiles/B_GC_MKCS_HolidayInnGREMCSv.pdf (25.11.2007)

The table compares projected electricity savings per year and calculated savings for a nine-month period. Holiday Inn has reduced energy consumption by 381.908kWh in a nine-month period, which is more than it was projected for a year.[6]

2.4. Hilton

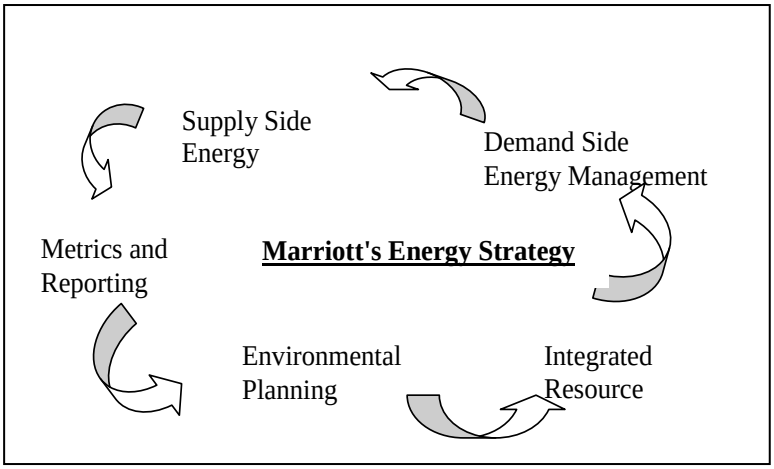
Several years ago, Hilton implemented an energy efficient lighting program for guestrooms. The average incandescent light bulbs use 750W, whilst compact fluorescent light bulbs (energy saving) use 220W which reduces expenses by 70%, without compromising guest comfort. Hilton also actively evaluates and implements "green" technologies including solar technology. These technologies allow renewable energy resource usage.[7]

2.5. Marriott

Marriott hotel chain conducts the energy strategy presented in picture 1. The strategy is based on establishment of a stable price of energy, critical legal actions, environmental planning ("green building") and reporting system.

[6] http://focusonenergy.com/data/common/dmsFiles/B_GC_MKCS_HolidayInnGREMCSv.pdf (25.11.2007)
[7] http://hiltonworldwide1.hilton.com/en_US/ww/business/environmental.do;jsessionid=12F778627100C6C99CFA28F663CDEC8C.etc23 (25.11.2007.)

Picture 1. Marriott's Energy Strategy



Source:http://www.epa.gov/dimateleaders/document/events/mar2007/maher.pdf (29.11.2007)

2.6. The Regent Hotel

According to the research conducted by The National Environment Agency on efficiency in energy savings, on the example of the Regent Hotel in Singapore, it has been determined that 26% of energy (expressed in kWh) has been saved after the "intelligent room" system had been implemented. The period estimated for payback on investments is one year and a half.[8]

3. HOTEL ENERGY CONSERVATION & EFFICIENCY TIPS[9]

Managing Your Hotel Energy Conservation Programme

- Chose one person that will be in charge of hotel energy strategy
- Set goals and share discuss results
- Monitor, record and post rates of hotel energy and water use
- Create a program that will stimulate hotel staff, and improve environmental awareness

Reduce Hotel Cooling Costs

- Check if all windows and doors have been appropriately insulated
- Educate hotel staff to turn off lights and turn down heating when rooms are unoccupied, and close the drapes during summer months

[8] http.//app.nea.gov.sg/cms/htdocs/article.asp?pid=2928 (27.11.2007)
[9] http://www.permafrostonline.com/resources/hotel-energy-saving-tips.php (27.11.2007)

- Avoid placing televisions, computers, hair dryers and lamps near thermostats. The heat from these and other appliances may affect thermostat readings and increase energy consumption for cooling.

Lighting
- Replace incandescent light bulbs with compact fluorescent light bulbs (LED-Light Emitting Diode)
- Use daylight as much as possible, particularly in hotel lobby, reception area, bar, restaurant
- Install motion sensors in offices, laundry and housekeeping

Reduce Hotel Water and Laundry Costs
- Place cards in guest rooms with specific suggestions for linen reuse program for sheets and towels
- Wash only full loads of laundry
- Use cold water laundry washing where possible
- Install low-flow showerheads
- Implement system that uses recycled hotel water for watering landscape

Reduce Other Hotel Energy Costs
- Place cards with energy efficiency suggestions in guest rooms
- Use low-energy sleep functions on computers, printers and copiers

4. SPECIALIST KNOWLEDGE AND PERSONNEL TRAINING

Energy efficiency in hotel industry is not solely the result of investment into sophisticated technology, but of continuous monitoring and active management of energy sources consumption. "Organisations often store knowledge not only in documents and data bases, but in management routines, processes, practice and norms".[10] This requires specialist knowledge and maintenance workers training, thus company's environmentally-friendly practice demands advances inhuman resource management. The ISO 14000 standard and Environmental Management System (EMS)[11] should be introduced.

Hotel Generic Hong Kong has adopted the ISO 14000 series of environmental management standards on a voluntary basis. The standards enable the hotel to establish an effective environmental management system, to achieve continual improvement of environmental performance and ensure regulatory and legislative compliance. The hotel maintains its EMS under independent certification under the ISO 14001 Standard. The EMS is seen as a management system that provides a mechanism for the hotel to operate in an environmentally responsible manner, anticipate and meet growing environmental performance expectations, and ensure ongoing compliance with

[10] Davanport, T. H., Prusak, L., Working Knowledge, «How Organization manage what that they know», Harvard Business School Press, Boston, 1998.
[11] CD Keeping Hong Kong's Hotel Industry Competitive into the 21st Century, *Environmental Management for Hotels,* Department of Building Services Engineering, The Hong Kong Polytechnic University

regulatory and legislative requirements. The EMS allows the hotel to address, control and improve the short-term and long-term impacts of its activities, products and services on the environment.

Hotel maintenance service lacks a position of facility manager[12], someone who possesses knowledge of mechanical, electrical and other disciplines of engineering, as well as of economics in maintenance process. The manager is not expected to be an expert in each of the sectors, but has to be acquainted with functional and organisational sides of the system. This represents a serious problem to hotel maintenance. The question that arises is who, if anybody is in charge of reduction and rationalisation of hotel energy expenses. Who is entrusted with the consideration of introducing renewable energy sources in hotel industry? There are professions in hotel organisation such as Energy Advisor, Director of Environmental Sustainability, various energy advisors or Power Board managers. Hotel management should pay more attention to energy expenses in accordance with "green accounting"[13], and be able to recognise environmental spending.

There is an urgent need of hotels for so called Energy card (building energy rating) which shows consumption of all energy sources. Furthermore, education and co-operation between experts in energy and tourism has to be arranged. Continuous personnel training raises awareness of possible way and amount of savings, since they are engaged in the actual consumption process, while board of directors and management should implement modern technologies to help to regulate consumption, thus increasing company's savings and profit.

CONCLUSION

The implementation of new technologies and keeping up with trends in hotel industry worldwide corresponds to the quality of services provided in a modern hotel. Croatia has to satisfy individuals' and tourists' needs, while preserving natural environment in the same time. From economic standpoint, the aim of tourism is to stimulate competitiveness and efficiency of tourism industry by developing its tourist attractions and facilities in harmony with the surrounding landscape and environmental principles. Thus, when building or reconstructing a hotel building, energy policies should be done in co-operation with experts in energy, zoning and tourism.

At present, hotels are perceived as the largest consumers of energy in building construction, and as establishments with complex installations, which have to provide guests with comfort and ease. Sophisticated technical solutions in monitoring and management system control all installations in a hotel and in the same time provide high level of comfort in all hotel facilities, with maximum energy efficiency and quick payback of investments. The monitoring and management system has to be connected with hotel system to enable operational monitoring and efficient hotel management.

[12] Laslavic, Z., «Hotelijeri na visak energije bacaju 100.000 eura na godinu», *casopis Lider*, studeni 2007., 73-73

[13] see above Persic, M., "Zeleno racunovodstvo-sto je i kome koristi?", Racunovodstvo i financije, br.12/2007, 47-53

The pattern "Intelligent guest room" should attract guests and create pleasant atmosphere in accordance with guests' personal desires.

Croatian research projects in the field of energy efficiency have been attributed as positive examples and role models by The World Bank They are followed by projects in hotel industry which would enable quick payback on investments since they are amortised through realised energy savings. Another important condition for investment profitability is a longer, preferably all-year, operation. The most important is that efficient energy consumption not only decreases expenses, moreover, it helps and works in an environmentally responsible manner.

According to the World tourism organisation predictions on global tourism perspective up to year 2020, the world will be characterised by increasing penetration of technology into all spheres of life.[14]

Connecting all guest room functions by computer significantly increased the quality of services, and trade as well. Thanks to the integration of various functions and central control and management system, intelligent rooms provide hotel staff with a great deal of information necessary for high-quality service, rational energy use and successful decision-making process. Nevertheless, as information science advances, the term "intelligent guest room" will be soon replaced by the term "smart hotel". A smart hotel is based on high-quality infrastructure and on possibility of connecting subsystems into one system, while all the data supplied has to be accurate, well-timed, detailed and never become an end to it self. Moreover, every information has to be tracked in order to help decide on further actions.

The task of every hotel is to improve technical and economic segment of energy savings in hotel industry, and to encourage substitution of organic fuels with renewable energy sources, which would raise awareness of energy consumption and environmental protection.

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